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CONTENTS

	PAGE
BENSON, Robert B., M.A., F.R.E.S. Classification of the PAMPHILIIDAE (Hymenoptera Symphyta)	25–33, 11 figs.
BENSON, Robert B., M.A., F.R.E.S. Classification of the XYELIDAE (Hymenoptera Symphyta)	34–37, 3 figs.
HINTON, H. E., B.Sc., Ph.D., F.R.E.S. A key to the North American species of *Terapus*, with a description of a new species (Col., HISTERIDAE)	38–45, 16 figs.
MOSELY, Martin E., F.Z.S., F.R.E.S. The designation of certain genotypes in the Trichoptera	46–47
Moss, the Rev. A. Miles, F.R.E.S. The *Castnia* of Pará, with notes on others (Lep. CASTNIIDAE)	48–52
SMART, John, B.Sc., Ph.D., F.R.E.S. *Drosophila subobscura* Collin: descriptive notes on the species with comments on its nomenclatoral status (Diptera)	53–56

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CLASSIFICATION OF THE PAMPHILIIDAE (HYMENOPTERA SYMPHYTA)

By Robert B. Benson, M.A., F.R.E.S.

Students of the sawflies are fortunate in having Dr. H. H. Ross's careful study of the North American sawfly families and genera (1937, "A Generic Classification of the Nearctic Sawflies (Hymenoptera Symphyta)": *Illinois Biol. Monog.* **15** (2) : 1–173, 424 figs.). The morphological data there amassed must be the starting-point for any further contributions on the major classification of the sawflies of the northern hemisphere for a long time to come.

The following studies were made as a preliminary to a revision of the British representatives of the family in an attempt to get first as comprehensive a view as possible of the world fauna. Here, as elsewhere, my primary difficulty has been lack of adequate material in the British Museum for such an endeavour, greatly aggravated during the present conflict in that deficiencies in material could not be overcome by borrowing from other museums.

Ross writes of the nearctic representatives of the family as forming a very uniform group. He says that he could find very few characters upon which to divide the group into definite segregates and that these were covered by the two forms of tarsal claw (bifid at apex or with small middle tooth), the presence or absence of a pre-apical spur on the front tibia, the presence or absence of a branch vein connecting the intercostal vein of the fore-wing with the costa, and the presence or absence of a triangular impression at the apex of the female hypopygium. From my studies I am able to add considerably to this list. Of the newly-discovered characters the different types of wing-membrane, the two types of spines on the legs, and the apical excisions of the tarsal segments need a few words of explanation. The form of the third antennal segment and the second abdominal tergite are also discussed.

(a) *Structure of the wing-membranes.*

Differences in the surface structure of the wing-membrane have not previously been used in sawfly taxonomy. Actually they seem to exhibit good group-characters in several of the families. In the Pamphiliidae I have classified these into two main types which can be recognised in the field.

1. *Coriaceous type.* This is probably the more primitive and occurs in the genera attached to coniferous trees. The surface of the membrane, at least at the apex of the fore-wings, is irregularly embossed so that it appears coriaceous in its rough dullness (fig. 10).

2. *Corrugated type.* In the genera attached to angiosperm trees and shrubs the surface of the membrane, at the apex of the fore-wings, appears corrugated into longitudinal wrinkles (fig. 9), though the bases of the wings are entirely smooth.

A survey of the membrane of the wings in other sawflies and Hymenoptera in general shows that the corrugated type, becoming much finer and more delicate in such Aculeates as Scoliidae, is probably developed from the coriaceous type and has the effect of improving the mechanics of flight. Presumably it would tend to prevent lateral folding and thus strengthen the longer narrower type of wing with its more rapid or powerful action. It is

best developed in species of which the individuals are large. These types of wing-membrane do not seem to be directly correlated with the pubescent clothing of the wings and may occur with or without a ciliate margin, though the corrugated type is more commonly associated with the naked margins.

The following is a survey of the wing-membrane types in the different sawfly families :—

XYELIDAE : coriaceous with entirely naked wings in *Xyela* and *Xyelatana*; entirely smooth but with pubescent clothing and ciliate margins in *Pleroneura, Xyelecia, Megaxyela* and *Macroxyela.*

MEGALODONTIDAE : corrugated with naked margins.

PAMPHILIIDAE : corrugated with naked margins in *Neurotoma* and *Pamphilius*; coriaceous in the rest.

XIPHYDRIIDAE : corrugated, though very slightly in small forms such as *Konowia* spp., with naked margins.

SIRICIDAE : corrugated with naked margins.

ORUSSIDAE : corrugated at the extreme apices in *Chalinus* and *Mocsarya*, with naked margins; entirely smooth in all others.

(PSEUDOSIRICIDAE : corrugated in these fossil forms; see Tillyard 1927, *Trans. ent. Soc. Lond.* **75** : 308.)

CEPHIDAE : smooth with ciliate margins.

DIPRIONIDAE : smooth; ciliate margin only in *Monoctenus* and *Augomonectus.*

BLASTICOTOMIDAE : corrugated with naked margins.

CIMBICIDAE : corrugated in CIMBICINAE and ZARAEINAE; coriaceous in CORYNINAE and PACHYLOSTICTINAE; naked margins.

TENTHREDINIDAE and ARGIDAE : usually coriaceous, at least at apices and usually with ciliate margins.

PERGIDAE : corrugated in PERGINAE (but not in PHILOMASTICINAE) in PTERYGOPHORINAE (but not in PERREYIINAE) and in SYZYGONINAE; in the rest the surface is smooth to coriaceous; with ciliate margins only in LOBOCERINAE, EURYIINAE and *Cladomacra* (an anomalous Perreyiine).

(b) *Membranous-tipped spines and spurs.*

In the PAMPHILIIDAE attached to coniferous trees the apices of the preapical tibial spines and the apical tibial spurs are truncate, tubercular or at least transparent in dried specimens (fig. 3). If a leg is placed in potash solution the spines and spurs swell out into small tubercles if they have not already dried in this form. On the other hand, in the genera attached to angiosperm hosts the spines and spurs are sharp and strongly sclerotised at their tips and do not swell out in potash (fig. 4).

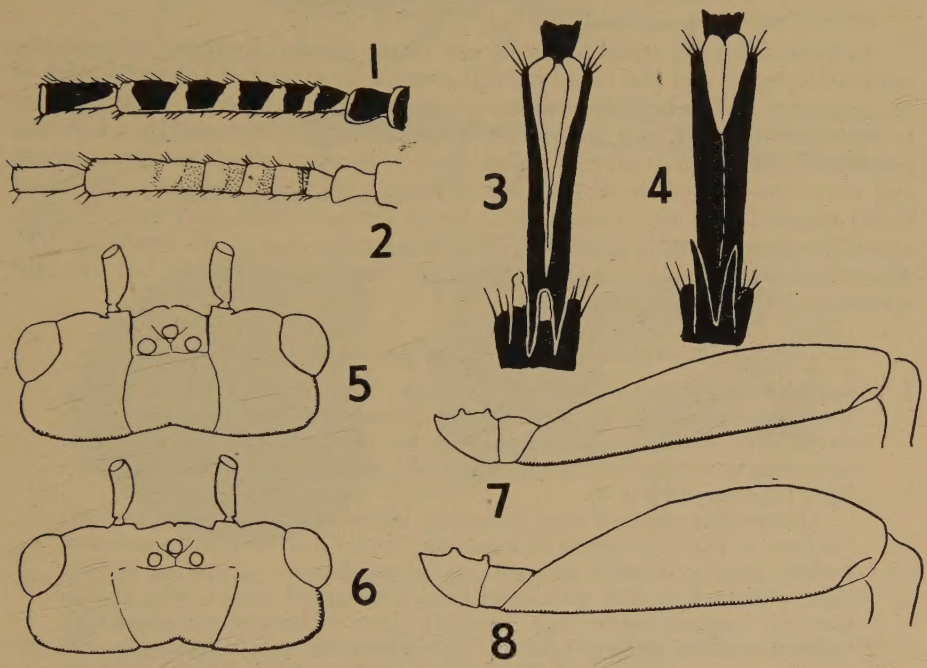
Such membranous-tipped spines and spurs are apparently very common and widespread in the Hymenoptera and lead to difficulties in estimating their lengths. In the sawflies they are not limited to PAMPHILIIDAE, but are characteristic of DIPRIONIDAE, CIMBICINAE and ZARAEINAE of CIMBICIDAE, of various ARGIDAE, and of most TENTHREDINIDAE.

(c) *Fusion of basal flagellar segments.*

An elongate third antennal segment (first flagellar segment) in its extreme form is characteristic of the sawfly families ARGIDAE and BLASTICOTOMIDAE and to a lesser extent the XYELIDAE. That the elongate segment is made up of a number of fused primary segments is evident in the XYELIDAE, where the

elongate segment is clearly lobed; different numbers of lobes are characteristic of different genera and suggest that different numbers of primary segments have fused together in different genera (although this does not seem to have been noticed before). In ARGIDAE the entire flagellum has fused into one composite segment, secondarily forked in males of certain genera. In the BLASTICOTOMIDAE a single free apical segment may or may not be present.

In the PAMPHILIIDAE the process of fusion has only just begun. In the *sylvaticus* group of *Pamphilius* apparently no fusion has taken place; in all other PAMPHILIIDAE the third antennal segment is clearly longer than the



FIGS. 1 and 2.—Portion of antenna to show 3rd segment in lateral view: in *Pamphilius balteatus* (Fall.) (fig. 1) and *Caenolyda reticulata* (L.) (fig. 2).
FIGS. 3 and 4.—Ventral surface of hind basitarsus in *Caenolyda reticulata* (L.) (fig. 3) and *Pamphilius betulae* (L.) (fig. 4).
FIGS. 5 and 6.—Head from above to show postocellar region in *Pamphilius sylvaticus* (L.) (fig. 5) and *Neurotoma saltuum* (L.) (fig. 6).
FIGS. 7 and 8.—Lateral view of hind femur in *Pamphilius sylvaticus* (L.) (fig. 7) and *Neurotoma saltuum* (L.) (fig. 8).

fourth and a careful examination reveals (at least in most specimens) that it is composed of four to six primary segments. This is apparent because it is often slightly lobed (well shown in *Caenolyda reticulata* (L.) (fig. 2)), or it may be annulated by conspicuous rings of darker colouring as in the following free segments (cf. *Pamphilius balteatus* Fallén, fig. 1).

The actual number of primary segments is not very clear, but in *Caenolyda reticulata* it seems to be six and in *Pamphilius balteatus* at least five. Even in such species as *Pamphilius stramineipes* (Hartig), in which the basal flagellar segment is reduced to but $1\frac{1}{2}$ times the length of the following segment, the existence of primary subdivisions of the segment is apparent. To return

now to *P. sylvaticus*, it is possible that here too the basal flagellar segment is also composite, but that further reduction has obliterated the sub-divisions.

(d) *Divided second abdominal tergite.*

In all the PAMPHILIIDAE, but in no other sawflies that I have examined, the second abdominal tergite as well as the first is divided mesially. This conspicuous family character does not seem to have been noticed before and forms one further big distinction between PAMPHILIIDAE and MEGALODONTIDAE.

(e) *Ventral excisions of tarsi.*

In Cephalciini the tarsal segments are deeply excised from the apex on the underside (fig. 3) and the tarsal pulvilli cover a large part of the undersides of the segments from which they arise. In the sawflies this seems to be peculiar to the PAMPHILIIDAE and certain XYELIDAE; in all other sawflies where the pulvilli are developed at all they mostly only project apically from each segment and cover the base of the succeeding segment. In most Cephalciini the basal tarsal segments are thus membranous below for more than half their lengths, and the excision is continued as a suture to near the base of the segments. In *Neurotoma* and *Pamphilius* the sutures are obsolescent (fig. 4), but are still apparent in *P. betulae* (L.).

Key to subfamilies, tribes and genera of PAMPHILIIDAE.

1. Claws with small inner tooth scarcely longer than its basal breadth; wing membranes coriaceous at apices (fig. 10); tibial spurs and spines membranous at tips; basal tarsal segments with the ventral apical excisions often extending more than half the length of each segment and with correspondingly long pulvilli (fig. 3).

   [Postocellar region of head defined by lateral sutures diverging towards the front so that if produced forwards they would pass outside the antennal sockets (fig. 6); frontal area without lateral furrows separating it from inner orbits; fore tibia with or without a pre-apical spine; wing stigma generally long and narrow (figs. 10 and 11) (greatest breadth compared with transverse radial being at least 1 : 1·5); intercostal vein of fore-wing with front branch always present; femora less stout (fig. 7) (hind femora with its greatest depth less than 1½ times its apical depth); ♀ hypopygium with an impressed apical triangle. Larva with 2nd segment of sub-anal process longer than 3rd or equal to it; in webs, singly or socially; on Coniferae.] **CEPHALCIINAE** subfam. n. . . . . 2.

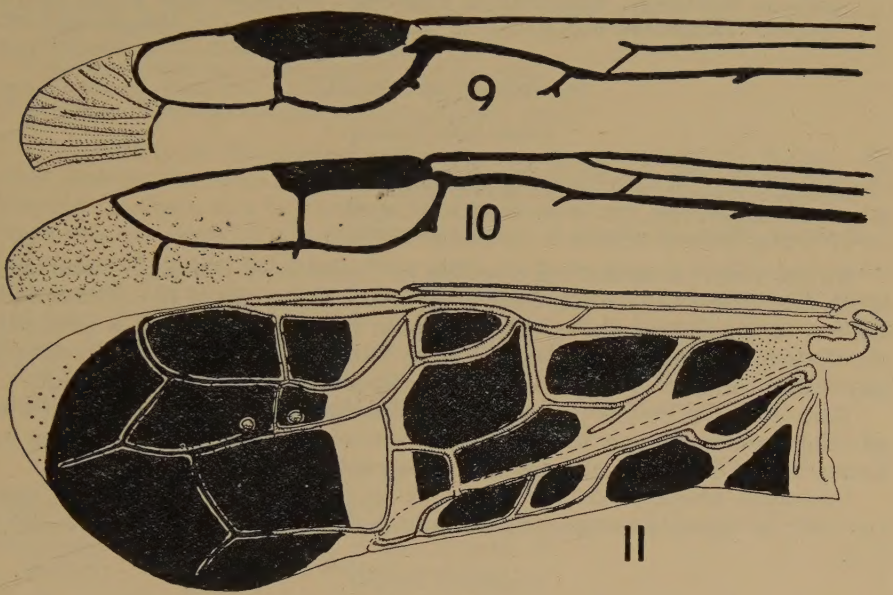
–. Claws bifid at apex, the inner tooth much longer than its basal breadth; wing membranes longitudinally corrugated at the apex (fig. 9); tibial spurs and spines acute and fully sclerotised at tips; basal tarsal segments with the ventral apical excisions not extending as much as ½ the length of each segment and the tarsal pulvilli correspondingly short (fig. 4).

   [Fore tibia without a pre-apical spine; wing stigma generally short and broad (fig. 9) (the greatest breadth compared to length of transverse radial vein ranging from 1 : 1 in *Neurotoma* to 1 : 2 in *Pamphilius*); femora stouter (fig. 8) (hind femora with its greatest depth from 2 to 1½ times its apical depth). Larva with 2nd segment of sub-anal process clearly horter than 3rd; on angiosperm trees and shrubs, mostly Rosaceae and catkin-bearing orders such as Salicaceae, Betulaceae, etc.] **PAMPHILIINAE** subfam. n. . . . . 4.

2. Fore-wing (fig. 11) with front branch of intercostal vein reaching to stigma; 1st transverse medial vein emerges at sharp angle from medius and is set

almost longitudinally; wings strongly and coarsely coriaceous throughout; front tibia without a pre-apical spine. Attached to *Pinus*. Palaearctic with one species in 2 subspecies. **Caenolydini** trib. n. . *Caenolyda* Konow.

–. Fore-wing (fig. 10) with front branch of intercostal vein joining costa before the point of origin of the radius from the subcosta; 1st transverse medial vein set at nearly a right angle from the medius or is obsolete; wings coriaceous at apex but more or less smooth at base; front tibia with or without a pre-apical spine. **Cephalciini** trib. n. . . . . 3.



FIGS. 9 and 10.—Portion of fore-wing to show shape of stigma, the costal region and the membrane surface in *Cephalcia arvensis* Panzer (fig. 9) and *Neurotoma saltuum* (L.) (fig. 10).

FIG. 11.—Fore-wing of *Caenolyda reticulata* (L.) to show general pattern, stigma, unique intercostal vein, and longitudinal 1st transverse medial vein.

3. Front tibia with a pre-apical spine. Attached to *Pinus*. Holarctic with about 40 species. . . . . *Acantholyda* A. Costa.

–. Front tibia without a pre-apical spine. Attached to *Abies*, *Picea* or *Larix*. Holarctic with about 30 species. . . . . *Cephalcia* Panzer.

4. Postocellar region of head bordered by sutures diverging in front (fig. 6) (so that if produced forward they would pass outside antennal sockets); frontal area not separated by furrows from the inner orbits each side. ♀ hypopygium with a triangular apical impression. Fore-wing with the front branch of the intercostal vein usually obsolete (fig. 9); stigma short and broad (usually almost as broad as the length of the transverse radial vein); transverse radial vein joins stigma between the middle and the apical 3rd of the latter. Hind femur with its greatest depth about twice its apical depth (fig. 8).

Larvae socially or singly in webs and mainly attached to Rosaceae. Holarctic with about 11 species. **Neurotomini** trib. n. . *Neurotoma* Konow.

–. Postocellar region of head bordered by furrows, curved or sub-parallel but not diverging in front (fig. 5); the furrows are almost continuous with furrows that extend to the antennal sockets and separate the frontal area from

the inner orbits on each side. ♀ hypopygium without a triangular apical impression. Fore-wing with intercostal vein forked at apex, one branch joining the costa and the other the sub-costa (cf. fig. 10); stigma narrower and longer (clearly narrower than the length of the transverse radial vein); transverse radial vein joins the stigma beyond the apical 3rd of the latter. Hind femur with its greatest depth generally less than twice its apical depth (fig. 7).

Larvae singly in leaf-rolls mostly on Rosaceae or catkin-bearing trees such as Betulaceae, Salicaceae or Fagaceae. Holarctic with about 80 species. **Pamphiliini** trib. n. . . . . *Pamphilius* Latr.

Synonymy of Genera.

Caenolyda Konow.

Caenolyda Konow, 1897, *Ann. nat. Hofmus. Wien* **12** : 15.
Genotype : *Tenthredo reticulata* L. (Rohwer 1910).
Dictyolyda Semenov, 1934, *C.R. Acad. Sci. U.R.S.S.* **3** : 63.
Genotype : *Tenthredo reticulata* L. (original designation).

Konow (1897) separated off a section of *Cephalcia* in which the basal vein of the fore-wing joins the sub-costa at or before the origin of the cubitus as a distinct subgenus *Caenolyda*. The group as defined by Konow is artificial, but the genotype happens to be an archaic Pamphiliid very distinct in certain important characters from all other *Cephalcia* and all other Pamphiliidae.

Ross (1937, *loc. cit.*) in proposing *Caenolyda* as a synonym of *Cephalcia* was referring presumably only to those species artificially cut off from *Cephalcia* by Konow's poor definition, and not to the type species.

Caenolyda praeteritorum (Semenov), from the Altai mountains, can conveniently be regarded as a geographical subspecies of the European *C. reticulata* (L.).

Cephalcia Panzer.

Cephalcia Panzer, 1805, *Fauna Ins. Germ.*, 86, pl. 9.
Genotype : *Cephalcia arvensis* Panzer (Rohwer 1911).
Cephalcia Jurine, 1807, *Nouv. Méth. Class. Hym.* : 68.
Genotype : *Tenthredo signata* Fab., *Cephalcia arvensis* Panzer (Rohwer 1911).
Liolyda Ashmead, 1898, *Canad. Ent.* **30** : 209.
Genotype : *Lyda frontalis* Westwood (original designation).

Ross (1937, *loc. cit.*) retains the genus *Acantholyda*, distinguished from *Cephalcia* solely on the basis of the presence of a pre-apical spine on the fore tibia. I have not been able to correlate any other structural character with this. If one selected any other single arbitrary character, such as the presence or absence of the 1st transmedial stub in the fore-wing, or the presence or absence of a stub at the anal apex of the anal cell in the hind-wing, or the different colour-pattern groups, different segregations of species would arise. It is one thing to separate groups on a single character, but quite another to *base* groups on a single character.

Genera based on single morphological characters unsupported by any other evidence and running counter to segregations that could be devised by selecting arbitrarily any other single character are suspect. It does so happen that all the described larvae of *Acantholyda* are attached to *Pinus* while all the described larvae of *Cephalcia* are attached to *Abies*, *Picea* or *Larix*. If this correlation is borne out by future investigations, it would appear that the two were natural groups. I therefore retain them for the present. *Larix*, however, is not very closely related to *Abies* and *Picea*. *C. alpina* (Kl.) (Europe) and *C. koebelei*

Rohwer (Japan) are the only known species to be attached to *Larix*; the former of these is rather abnormal for a *Cephalcia* on head-structure, but until more is known it does not seem advisable to separate off another genus here. Also it should be mentioned that *Acantholyda populi* (L.) has two pre-apical spines on the fore tibia, but I have seen no specimens of it and its biology is unknown.

Acantholyda A. Costa.

Acanthocnema A. Costa, 1859, in O. Costa, *Fauna Regno Napoli*, Imen. 3, Lid., 2. For which I here designate *Tenthredo erythrocephala* L. as genotype.
Acantholyda A. Costa, 1894, *Prosp. Im. Ital.* **3** : 232.
Genotype : *Tenthredo erythrocephala* L. (Rohwer 1910).
Itycorsia Konow, 1897, *Ann. nat. Hofmus. Wien* **12** : 13.
Genotype : *Tenthredo hieroglyphica* Christ (Rohwer 1910).

The validity of this genus I have already discussed under *Cephalcia*. By strict priority the name should be changed to *Acanthocnema*. This name was given by A. Costa in a key without the inclusion of any species, but it clearly represents the group for which he later proposed the name *Acantholyda*. As the name *Acanthocnema* has never been used since its inception, it would cause unnecessary confusion to start using the name here now, especially as the name was later given to a valid genus of CORDYLURIDAE in Diptera (Becker, 1894, *Berlin. ent. Z.* **39** : 136). It seems desirable that the name *Acanthocnema* A. Costa 1859 should be suppressed, and the case is being submitted to the International Commission on Zoological Nomenclature for consideration.

Neurotoma Konow.

Neurotoma Konow 1897, *Ann. nat. Hofmus. Wien* **12** : 18.
Genotype : *Tenthredo flaviventris* Retz. = *N. saltuum* (L.) (Rohwer 1910).
Gongylocorsia Konow 1897, *Ann. nat. Hofmus. Wien* **12** : 19.
Genotype : *Lyda mandibularis* Zaddach (monobasic).

Conde (1934, *Mitt. deuts. ent. Ges.* **5** : 42) states that *Neurotoma nemoralis* (L.) sometimes has a fully developed front prong to the intercostal fork of the fore-wing and that thus in this character it resembles *Pamphilius*; as he could find no other characters for separating these two genera he proceeded to treat *Neurotoma* as a species-group of *Pamphilius*.

Pamphilius Latreille.

Pamphilius Latreille 1802, *Hist. nat. Crust. Arach. Ins.* **3** : 303.
Genotype : *Tenthredo sylvatica* L. (monobasic).
Lyda Fabricius 1804, *Syst. Piezatorum* : 43.
Genotype : *Tenthredo sylvatica* L. (Curtis 1831).
Anoplolyda A. Costa 1894, *Prosp. Im. Ital.* **3** : 233.
Genotype : *Lyda alternans* A. Costa (Rohwer 1910).
?*Kelidoptera* Konow 1897, *Ann. nat. Hofmus. Wien* **12** : 20.
Genotype : *Lyda maculipennis* J. P. Stein (monobasic).
Bactroceros Konow 1897, *Ann. nat. Hofmus. Wien* **12** : 21.
Genotype : *Tenthredo vafra* L. (Rohwer 1910).
?*Pseudocephalcia* Zirngiebl 1937, *Festschr. 60 Geburtst. von E. Strand* **3** : 339.
Genotype : *Pseudocephalcia brachycercus* Zirn. (monobasic).
Onycholyda Takeuchi 1938, *Tenthredo* **2** (2) : 218.
Genotype : *Pamphilius sulphuripes* Kirby (original designation).

Without seeing representatives of the genotype of *Kelidoptera* I hesitate to accept Ross's (1937) placing of this genus as a synonym of *Pamphilius*; although Konow was able to distinguish this genus only on trivial venational characters, this can be taken as no criterion of the validity of Konow's genera (see *Neurotoma*

above). It would appear from Zirngiebl's description that *Pseudocephalcia* differs from *Pamphilius* only in its very short antennae (only as long as head plus ½ thorax) and in its similarity of wing-pattern to *Caenolyda reticulata* (L.) and *Kelidoptera maculipennis* (J. P. Stein). Without further evidence I am not prepared to accept *Kelidoptera* or *Pseudocephalcia* as valid genera. Various other single species could just as reasonably be isolated into other monotypical genera on the basis of single morphological characters. Such procedure is common in mechanical systematics, but does violence to our knowledge of genetics as a guide to classification based on relationships. The whole genus does, however, contain several natural groups with a correlation of characters, and some of these have been partly segregated off as subgenera by various authors; unfortunately these are still too ill-defined to be maintained at present as separate genera.

Discussion.

(*a*) Major classification of Pamphiliidae.

In the scheme proposed above I have separated five genera into two very distinct groups. To show the degrees of difference I have proposed two subfamilies, one attached to Coniferae and the other to Angiosperms (mostly Rosaceae and allied catkin-bearing trees). The parallel with the classification of Siricidae into two subfamilies likewise correlated on the one hand with Coniferae and on the other hand with angiosperms is significant (see Benson, 1943, " Studies in Siricidae . . ." *Bull. ent. Res.* **34** (1) : 27–51). The major classification in Cephidae and Xyelidae also shows a close correlation of insect groups with host-plants, as I intend to show in forthcoming papers.

It might be suggested that with only five genera distinguished in Pamphiliidae the further division of the subfamilies into two tribes each (three of them with only one genus apiece) was unjustified. This was done, however, to stress the different order of differences between *Cephalcia* and *Acantholyda* on the one hand, and between the other genera among themselves and when compared with these two genera on the other hand. Furthermore, as I have suggested above, it might later be thought desirable to separate into distinct genera certain other segregates now included in *Pamphilius* etc., when more is known about them.

It is interesting that just as the individual species of *Pamphilius* are decidedly monophagous (see Stritt, 1935, *Verh. naturw. Ver. Karlsruhe* **31** : 137–152) so also do the species groups show a tendency to be associated with related food-plants. For example the *latifrons-histrio* group is associated with *Populus*, the *varius-pallipes* group with Betulaceae etc. In contrast to this, attention should be drawn to *Cephalcia alpina* (Klug) (on *Larix*) which, whether it be separated into a separate genus or not, is apparently more closely related to those species on *Abies* and *Picea* than to those on *Pinus*, although botanically *Larix* is generally considered closer to *Pinus* than to *Abies* and *Picea*.

(*b*) Phylogeny of Pamphiliidae.

It is noticeable that in the Pamphiliidae as in the Siricidae and Argidae the genera attached to Coniferae are characterised by the possession of more primitive features than those attached to angiosperms. In the retreat of the inter-costal vein *Caenolyda* represents the most primitive condition and *Neurotoma* the most advanced. In *Caenolyda* the form of the intercostal vein is

more primitive than in any other hymenopteron. The form of the stigma is likewise primitive in *Caenolyda*, long and narrow with an unsclerotised area in the middle; it is broadest in *Neurotoma*. *Pamphilius* has departed from the other genera in many characters, including the leaf-rolling habit of the larvae (only possible on broad-leafed host-plants); at the same time it has the least reduced 2nd transverse-medial vein in the fore-wing of all genera and includes forms which appear to have the least modified antennae. From egg-counts we note that *Acantholyda erythrocephala*, with only 16, has the fewest and largest eggs of all sawflies known (Forsius, 1920, *Medd. Soc. Fauna Fl. fenn. Helsingfors* **45** : 169–184), while *Neurotoma saltuum* L., an insect no larger in size, has a comparatively large number of eggs for a sawfly, about 200 (Schmidt, 1938, *Kranke Pflanze* **15** (10) : 169–173). This may have some significance if we accept Berlese's theory that the more primitive insects lay eggs of a later ontological stage than the less primitive (see Imms, 1931, *Recent Advances in Entomology*). The more advanced eggs would presumably be larger and fewer, but this of course needs cytological investigation in PAMPHILIIDAE.

(*c*) On the association of Rosaceae with the catkin-bearing trees as insect host-plants.

In a communication to the Royal Entomological Society of London on 4 Nov. 1942 (see 1942, *Proc. R. ent. Soc. Lond.* **7** (C) : 17), I drew attention to the frequent association in sawflies of the Rosaceae with the catkin-bearing trees Salicaceae, Betulaceae and Fagaceae, and ventured to suggest that this lent support to the view (see Hutchinson, 1926, *The Families of Flowering Plants*, **1,** Dicotyledons) that these plant families are phylogenetically related. This suggestion was later taken up by my colleague Mr. A. J. Wilmott in his part of the discussion held at the Society on 12 Nov. 1943 (see 1943, *Proc. R. ent. Soc. Lond.* **8** (C) : 52).

On second thoughts I am not now sure that the evidence really amounts to very much. Although the correlation is very evident in group after group (e.g. PAMPHILIIDAE as I have shown above), there are several exceptions; also we have to set against this the fact that we yet have very little knowledge of sawfly food-plant relationships outside N. and C. Europe and N. America, in which regions the Rosaceae and the catkin-bearing orders are anyway the dominant woody or arborescent plants. This apparent relationship as shown by insect hosts may not then be phylogenetic in its origin; it may be no more than an association with woody or arborescent plants. The main thesis of my communication on that occasion was that in sawflies and other phytophagous insects the more primitive members are associated with those plant-families with a tendency to develop wood. In at least the families SIRICIDAE, PAMPHILIIDAE and ARGIDAE (the primitive Australian *Zenarge* on *Callitris*) the most generalised representatives, I pointed out, were associated with coniferous trees and the less generalised with angiosperms; the particular angiosperms concerned are naturally those forms most dominant in the regions from which the evidence is taken.

The other correlation in sawfly host-plants to which I drew attention on this occasion was between Ranunculaceae and Monocotyledons, but we are not concerned with this in the PAMPHILIIDAE.

CLASSIFICATION OF THE XYELIDAE (HYMENOPTERA SYMPHYTA)

By Robert B. Benson, M.A., F.R.E.S.

Ross (1937) gives a key to the nearctic genera of Xyelidae, and this includes all the described world-genera except *Xyelatana* Benson. In this paper he stresses the isolation of each genus and notes that this would appear to be another feature indicating the great antiquity of the group. The discovery in the Lower Jurassic of Turkestan of a fossil (Martynov 1937), which on venational characters would appear undoubtedly to belong to the Xyelidae as defined on the basis of living insects, is in striking confirmation of the general view that this family is of great antiquity. The species *Liadoxyela praecox* Martynov is the earliest known fossil hymenopteron and far and away the earliest known representative of a modern hymenopterous family; yet it has venation scarcely distinguishable from modern *Macroxyela* or *Megaxyela*. In size (fore-wing 12 mm.) it agrees with the nearctic *Megaxyela major* (Cresson).

Another interesting feature of the family has been pointed out to me by my colleague Mr. J. F. Perkins; its only known parasites belong to a peculiar genus *Lysiognatha* Ashmead (on nearctic *Xyela*), which is considered by Cushman (1937) to represent a primitive ichneumonid subfamily Lysiognathinae, in some respects intermediate between primitive Ichneumoninae and primitive Tryphoninae (a subfamily mainly associated with sawflies), but unique in the Ichneumonidae in having exodont mandibles. It is most interesting that a very primitive sawfly should have as parasite an equally primitive Ichneumonid.

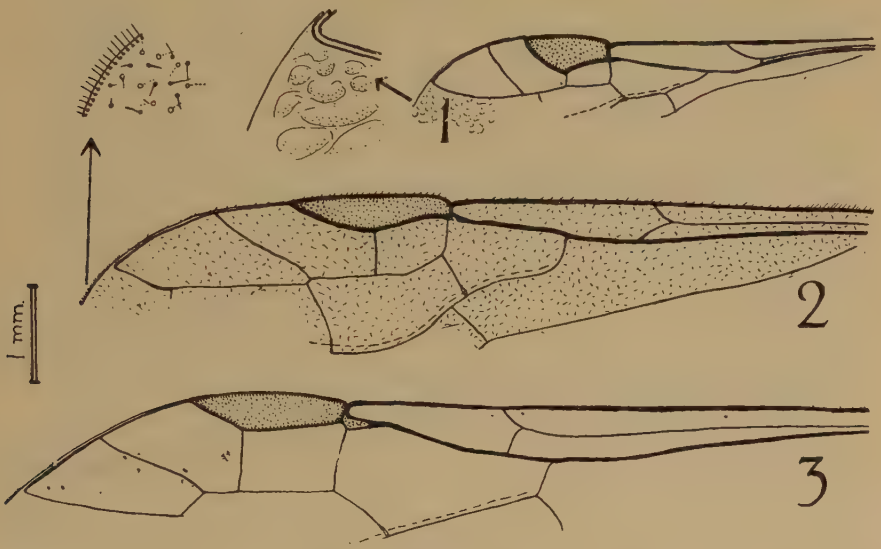
In addition to the various characters used by Ross in defining the genera, I have discovered others, including the form and clothing of the wing-membranes, the shape of the stigma, the different numbers of primary segments that go to make up the enlarged fused basal flagellar segment and the development of the tarsal pulvilli. Most of these characters are discussed and figured in my paper on Pamphiliidae (Benson 1945). Furthermore, Snodgrass (1937) has shown that *Xyela* and *Pleroneura* differ from other Xyelidae in that their male genitalia are strophandrous (twisted through 180°), a character previously thought in sawflies to be restricted to the Tenthredinoidea.

When we consider the classification of this family in relation to these various new features, we find two groups, each of two closely related genera, and two other very isolated genera. To represent these different degrees of affinity I propose to recognise four subfamilies. It will be noticed in my scheme that where the host-plants are known the affinities of the genera include those of the host-plants. A similar correlation between affinities of genera and affinities of host-plant I have already shown to be present in Siricidae, Cephidae, Pamphiliidae, Diprionidae and certain groups of Tenthredinidae. The adults of at least some of the Xyelidae are voracious pollen feeders (cf. the primitive lepidopterous subfamily Micropteryginae of the Micropterygidae). It is perhaps also significant that the larvae are also attached to wind-pollenated trees, trees in fact prolific in pollen-production; in *Xyela* the larvae actually feed on the developing pollen in the male catkins of *Pinus*.

On deciding on the affinities of the family as a whole, Ross associated the

Xyelidae with the Pamphiliidae and Megalodontidae in the superfamily Megalodontoidea.

I am indebted to Dr. H. H. Ross of Illinois for giving me information about nearctic *Macroxyela* and *Megaxyela* and for sending me a valuable female of *Xyelecia nearctica* Ross on loan.



Part of left fore-wing to show form of intercostal vein, shape of stigma and position of basal vein, with small fragments of wing-membrane magnified ten more times to show clothing and embossing.

Figs. 1–3.—1, *Xyela julii* Brébisson; 2, *Pleroneura numidica* Benson; 3, *Macroxyela ferruginea* (Say).

Key to subfamilies and genera of Xyelidae.

The palaearctic species were revised recently by Gussakovskiĭ (1935), while the Japanese species were dealt with by Takeuchi (1938).

The European species of *Xyela* and *Xyelatana* were revised by Benson (1938). *Pleroneura numidica* Benson (Algiers) was added by Benson (1940). The American species of *Xyela* were last revised by Rohwer (1913) and the other Xyelidae by Ross (1932). The synonymy of the genera has been dealt with by Ross (1932 and 1937) and requires no further comment.

1. Intercostal vein of fore-wing (fig. 1) fused along sub-costa except for the apical trans-costal branch; stigma broader than the length of the 1st trans-radial vein; wing-membrane coriaceous at apex of wings, with the pubescence obsolete and margins naked. 3rd segment of antenna lobed into apparently 8 primary segments and the apical filament is of 9 segments. Small species (under 4 mm. long without ovipositor); ovipositor down-turned at extreme apex.

   [Male genitalia twisted through 180°. Maxillary palp with elongate 3rd segment (as long as, or longer than, the whole of the rest of the maxilla). 1st trans-radial vein of fore-wing received near the middle of the stigma. Holarctic. ?All on Pinaceae. Known larvae eat male catkins of *Pinus*.] . . . . . (Xyelinae.)

–. Intercostal vein free throughout its length (figs. 2 and 3); stigma narrower than length of 1st trans-radial vein; wing-membrane smooth and with fine though definite ciliate margin, though the pubescence on the rest of the wings may be present or obsolescent. 3rd antennal segment evidently consisting of more than 8 lobes. Larger species (over 5 mm.); ovipositor often up-turned . . . . . 2.

2. Intercostal vein of fore-wing forks before the point of origin of the cubital vein from the sub-costa (fig. 2); wings densely pubescent. 3rd segment of the maxillary palp much longer than 1st antennal segment and as long as, or longer than, the whole of the rest of the maxilla except for its palp. 3rd segment of antenna with 9–17 lobes. Holarctic . . . . . 3.

–. Intercostal vein forks after the point of origin of cubital vein from sub-costa (fig. 3); wings with sparse or obsolete pubescence. 3rd segment of maxillary palp much shorter than 1st antennal segment or rest of maxilla. 3rd segment of antenna apparently made up of more than 16 lobes. Nearctic and E. Asia. [Larvae leaf-feeders on catkin-bearing angiosperm trees (Juglandaceae and Ulmaceae). 3rd antennal segment about 3 times as long as the 8–9-segmented apical filament; male genitalia normal in position] . . . . . (**Macroxyelinae** subfam. n.) 5.

3. Apical filament of antenna made up of 9–12 segments which together are not more than half length of 3rd segment; 3rd segment 9–10 lobed and clearly shorter than breadth of head. Maxillary palp with an irregular apical filament of more than 4 segments. Basal vein of fore-wing received on cubitus near 1st trans-cubital and more than its own length from the costa. Male genitalia twisted through 180°. Holarctic with about 10 species.

Genotype: *Xyela dahli* Htg. (Rohwer 1911). Larva undescribed, but adults associated with *Picea* (only genus *Pleroneura* Konow).

(**Pleroneurinae** subfam. n.)

–. Apical filament of antenna with 24 or more segments which together are about as long as the 3rd antennal segment; 3rd segment with more than 13 lobes and clearly longer than breadth of head. Maxillary palp with 4 clear segments. Basal vein received on cubitus close to origin of latter from sub-costa. Male genitalia normal in position, not twisted 180°. One species, in N.W. America.

Genotype: *Xyelecia nearctica* Ross (only genus *Xyelecia* Ross).

(**Xyelecinae** subfam. n.)

4. Maxillary palp much enlarged with the 3 basal segments thicker than the 3rd antennal segment; 3rd segment of palp much longer than 1st antennal segment. Stigma at least twice as broad as length of 1st trans-radial. Female ovipositor much shorter than whole of rest of insect. Holarctic.

Genotype: *Xyela pusilla* Dalman (designated by Curtis 1824) = *Pinicola julii* Brébisson. . . . . *Xyela* Dalman.

–. Maxillary palp with the 3 basal segments thinner than the 3rd antennal segment; 3rd segment of palp much shorter than 1st antennal segment. Stigma less than twice as broad as length of 1st trans-radial. Female ovipositor about as long as the whole of the rest of the insect. One species in two subspecies: *X. longula longula* (Dalman) (C. & N. Europe) and *X. longula piliserra* (Thomson) (Lapland).

Genotype: *Xyela longula* Dalman. . . . . *Xyelatana* Benson 1938.

5. Clypeus with a large median acute tooth; labial palp 4-segmented; 3rd antennal segment about $1\frac{1}{4}$ times as long as the breadth of the head. Tarsal pulvilli minute and the apical ventral excisions of tarsi scarcely longer than broad. 3–4 species confined to N. America and one in E. Asia.

Genotype: *Xyela major* Cresson. Larvae on *Juglans* and *Carya* (Juglandaceae) . . . . . *Megaxyela* Ashmead.

–. Clypeus with median lobe rounded and slightly indented at apex; labial palp 3-segmented; 3rd antennal segment about equal to breadth of head. Tarsal segments ventrally with strong apical excisions containing the enlarged pulvilli; on the hind tarsal segments 2–4 the excision is greater than ½ the length of the tarsal segment. Confined to N. America with 4 species.

Genotype : *Xyela ferruginea* Say. Larvae on *Ulmus* (Ulmaceae).

Macroxyela W. F. Kirby.

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A KEY TO THE NORTH AMERICAN SPECIES OF *TERAPUS*, WITH A DESCRIPTION OF A NEW SPECIES (COL., HISTERIDAE)

By H. E. Hinton, B.Sc., Ph.D., F.R.E.S.

(Department of Entomology, British Museum (Natural History).)

Introduction.

The species of *Terapus* are true ant guests (symphiles) which have on various parts of their bodies clusters of golden-yellow hairs or trichomes associated with the openings of exudate glands. They occur, as far as is known, only in the nests of ants of the genus *Pheidole*. Twelve species of *Terapus* have been described, and all have been found in the region from Argentina to Southern California. To the six species now known from North America a new one from Mexico is added here.

In my previous key (1924), written while I was working in California, the genotype, *T. mniszechi* Marseul (by monotypy), was included on the characters of specimens collected at Sayula, Jalisco, and said by Mr. W. M. Mann to be identical with specimens collected at San Miguel, Hidalgo, the latter specimens having previously been compared by Mr. Mann with an example of *T. mniszechi* sent from the British Museum. The specimens from Sayula belong, however, to a new species only distantly related to *T. mniszechi*.

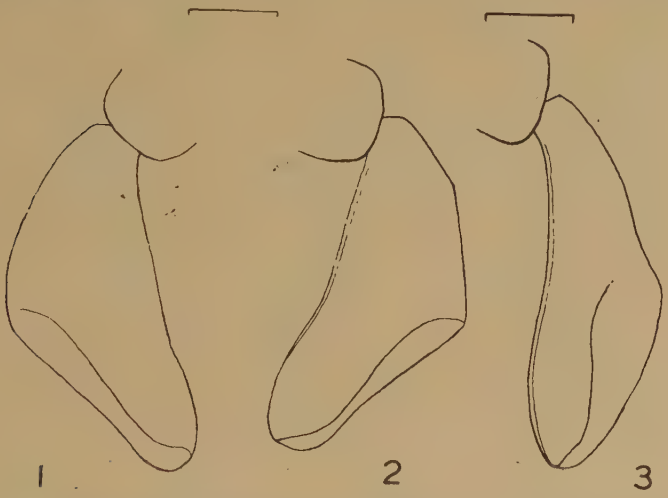
Bickhardt (1912) sank *T. infernalis* (Fall) of California as a synonym of *T. mniszechi* Marseul of Mexico. Mann (1914) showed that *T. infernalis* was a valid species, and he listed a few of the specific differences between the two. In spite of this, however, *T. infernalis* has again been sunk as a synonym of *T. mniszechi* by Blackwelder (1944). The differences between these two species, listed in the key given below, are based on an examination of topotypes of both and should prevent *T. infernalis* from again being considered to be a synonym of *T. mniszechi*.

Key to the North American species of *Terapus*.

1. Front tibia (figs. 1–2) with tarsal groove deep and only partly exposed from an anterior view. Middle tibia (figs. 6–7) broadly dilated from near base, and ventral margin strongly sinuate. Hind femur without a dorsal ridge. Hind tibia (figs. 10–11) without a distinct basal constriction; posterior surface nearly flat and region near dorsal edge of posterior face without channels, the trichomes arising from a flat or feebly concave surface. Femora and tibiae of all legs only microscopically punctate, the punctures being separated by at least three diameters . . . . . 2.

–. Front tibia (fig. 3) with tarsal groove very shallow and nearly entirely exposed from an anterior view. Middle tibia (figs. 4–5, 8–9) narrow at base and evenly broadened towards apex; ventral margin nearly straight. Hind femur with a sharp knife-like dorsal ridge. Hind tibia (figs. 12–15) distinctly constricted near base; posterior surface very broadly and deeply excavated and part of excavation near dorsal edge with numerous deep trichome-containing channels which run at right angles to the long axis of the tibia. Femora and tibiae of all legs with numerous very coarse and more or less confluent punctures . . . . . 3.

2. Disk of pronotum with shallow oval punctures, slightly coarser than facets of eyes, confined to basal region; apically only microscopically punctate. Elytron without an inner humeral ridge. Median prosternal carinae (or striae) converging anteriorly and joined together in a broad loop before apical lobe. Metasternum with lateral discal stria extending only slightly beyond middle coxa. Antero-ventral marginal line of tibiae absent or, on front and middle tibiae, fine and very indistinct; hind tibia without a large ridge on anterior face but with this surface irregularly convex. Mexico . . . . . *T. mexicanus* Mann (1926).



Figs. 1–3.—(1) Outline of anterior face of front tibia of *Terapus mexicanus* Mann. (2) Same of *T. balloui* Hinton. (3) Same of *T. manni* sp. n. Lines next to these and other figures refer to a length of 0·20 mm.

–. Disk of pronotum with shallow oval punctures present from base to apex but slightly finer on apical half. Elytron with inner humeral ridge distinct but only very feebly developed and extending nearly to apex. Median prosternal carinae parallel anteriorly and not joined together. Metasternum with lateral discal stria extending nearly to hind coxa. Antero-ventral marginal line distinct on all tibiae; hind tibia with a very large and prominent slightly oblique ridge on basal third of anterior face. Mexico *T. balloui* Hint. (1934).

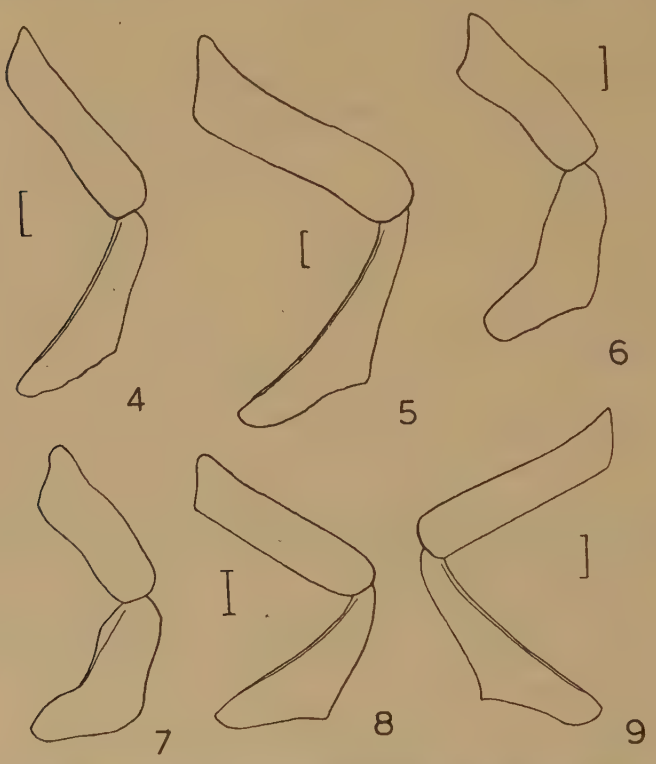
3. Propygidium with basal half coarsely punctate like apical half, without a distinct basal area of dense, microscopic punctures. Hind tibia (figs. 12–13) constricted only in basal one-seventh . . . . . 4.

–. Propygidium with a dense network of round, microscopic punctures occupying most or all of basal half; coarse punctures very sparse or absent in this microscopically punctate area which is only feebly shining or mat and looks velvety. Hind tibia (figs. 14–15) with basal fourth to third abruptly constricted . . . . . 6.

4. Pygidium weakly, sub-obsoletely punctate at base and smooth apically. Hind tibia with anterior face punctate like anterior face of hind femur. Arizona . . . . . *T. arizonensis* Ross (1938).

–. Pygidium very coarsely (punctures as large as those of propygidium), densely, and distinctly punctate on basal four-fifths; only extreme apex smooth. Hind tibia with middle of anterior face much more shallowly and sparsely punctate than middle anterior face of hind femur . . . . . 5.

5. Elytra with a few long, stout, erect setae along inner humeral ridge and apical margin, elsewhere only with minute setae. Propygidium and pygidium with only minute recumbent setae which are very much finer and shorter than long and erect setae of elytra. Pronotum with setose tubercle of mid-lateral area slightly broader than basal part of lateral pronotal ridge. Hind femur with slightly more than basal fourth of anterior face sparsely punctate; hind tibia with a setose tubercle (about as broad as a tarsal segment) on posterior margin of tarsal groove between dorsal edge and middle. Mexico . . . . . *T. nigritus* Hint. (1934).



Figs. 4–9.—(4) Outline of anterior face of middle femur and tibia of *Terapus manni* sp. n. (5) Same of *T. mniszechi* Marseul. (6) Same of *T. mexicanus* Mann. (7) Same of *T. balloui* Hinton. (8) Same of *T. nigritus* Hinton. (9) Same of *T. infernalis* (Fall).

–. Elytra with numerous long, stout, erect setae which on each elytron form three distinct longitudinal rows, one on inner humeral ridge, a second along median line of disk of elytron, and a third near suture; elytra also with long as well as very fine setae between these rows. Propygidium and pygidium with numerous long, erect setae similar to long setae of elytra. Pronotum with setose tubercle of mid-lateral depressed area distinctly narrower than basal part of lateral pronotal ridge. Hind femur with anterior face sparsely punctate only in proximal sixth or seventh; hind tibia without a tubercle on posterior margin of tarsal groove. Mexico *T. manni* sp. n.

6. Hairs of femora and tibiae often with two or more long branches; hind femur with numerous long hairs. Pronotum with surface between punctures

distinctly microscopically reticulate. Propygidium with microscopically reticulate area feebly shining except at extreme base. Median prosternal carinae widely diverging anteriorly. Hind tibia (fig. 14) with posterior margin of tarsal groove nowhere projecting beyond the anterior margin. Length, 2·0–2·5 mm. California . . . . *T. infernalis* (Fall) (1907).

Figs. 10–15.—(10) Outline of anterior face of hind femur and tibia of *Terapus balloui* Hinton. (11) Same of *T. mexicanus* Mann. (12) Same of *T. manni* sp. n. (13) Same of *T. nigritus* Hinton. (14) Same of *T. infernalis* (Fall). (15) Same of *T. mniszechi* Marseul.

–. Hairs on femora and tibiae always simple, not apically branched; hind femur with all or nearly all hairs minute and very difficult to see (mag. × 100). Pronotum with surface between punctures smooth or scarcely discernibly (mag. × 100) reticulate. Propygidium with microscopically reticulate

area not shining and mat. Median prosternal carinae (or striae) nearly parallel in anterior half. Hind tibia (fig. 15) with posterior margin of tarsal groove near ventral edge projecting beyond anterior margin. Length, 3–4 mm. Mexico . *T. mniszechi* [*mnizechi, err. typ.*] Mars. (1862).

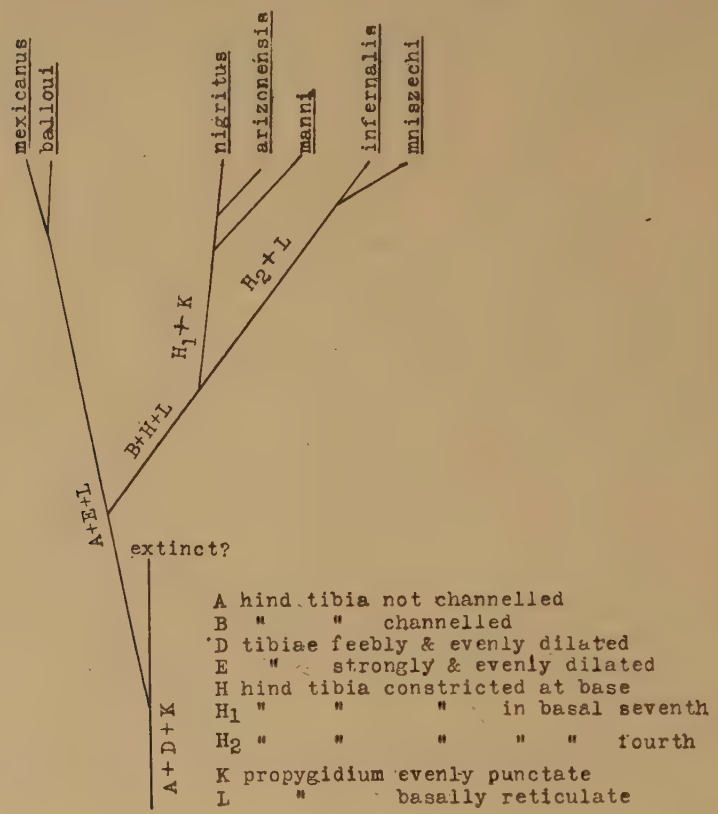


Fig. 16.—Phylogenetic diagram of the North American species of *Terapus*.

Terapus manni sp. n. (figs. 3–4, 12).

1934. *Terapus mniszechi* Marseul, Hinton, *Ent. News* **45** : 272.

♂. Length, 2·5 mm. (when head is retracted); breadth, 1·7 mm. Cuticle moderately shining and dark rufo-piceous with legs and antenna beyond scape slightly paler and more reddish-brown. *Head* with coarse (0·027 mm. broad), irregularly oval or round, moderately deep punctures which are contiguous to separated by nearly one-half of one diameter; surface between punctures smooth or scarcely noticeably (mag. × 100) alutaceous. Clypeus and labrum with punctures finer, sparser, and much less distinct; clypeus broadly and longitudinally depressed, the margins of the depression being indistinctly ridged; labrum with anterior half flexed upwards and anterior margin truncate. Sides of head over antennal bases and sides of clypeus with erect, golden-testaceous hairs 0·08–0·10 mm. long; surface elsewhere with very fine, suberect hairs, each arising from the side of a coarse puncture and each about as long as its puncture is broad. *Pronotum* with broadest point,

which is across base, half again as broad as long (1·45 mm. : 0·93 mm.) and base a fourth again as broad as apex (1·45 mm. : 1·15 mm.). Mid-lateral tubercle low and distinctly narrower than base of lateral lobe (0·14 mm. : 0·22 mm.). Disk punctate like vertex of head but with punctures rounder, very slightly sparser, and surface between them densely, distinctly, microscopically reticulate; lateral lobes and surface of mid-lateral depressed area with punctures very shallow to obsolete or absent. Pubescence as follows: (1) long, erect hairs similar to those of head restricted to sides of lateral lobes and mid-lateral tubercle, being denser on the tubercle than on the lateral lobes; and (2) microscopic hairs similar to those of head everywhere present, even on lateral lobes where coarse punctures are absent. *Elytra* with inner humeral ridge distinct, sharp, and extending to about apical eighth; outer humeral ridge well developed but confined to basal third or two-fifths; extreme side with a ridge which joins outer humeral ridge at base and extends caudally more or less parallel to epipleuron to a point opposite end of outer humeral ridge. Surface with punctures as coarse to a third again as coarse as those of pronotal disk; punctures sometimes open behind and with the central part of each feebly elevated; middle two-thirds on either side of suture highly polished and very sparsely and finely punctate, the punctures on each side of this polished area becoming denser and coarser towards sides so that near inner humeral ridge they are often confluent; vertical side of each elytron with the punctures more oval, shallower, and slightly sparser, the surface between them being more shining; surface between all punctures (except fine ones on polished sutural area) densely reticulately alutaceous. Pubescence similar to that of pronotum but long hairs moderately dense and on each elytron forming three distinct longitudinal rows, one on inner humeral ridge, a second along median line of disk of elytron, and a third near suture. *Scutellum* 1·0 mm. broad and shaped nearly like an equilateral triangle. *Propygidium* with an arcuate, transverse, carina-like ridge on caudal fourth; ridge narrowly and completely interrupted at middle and less strongly developed on middle sides than near median line or near extreme sides. Surface from base to apex with oval to round punctures as coarse to slightly coarser than those of pronotum, contiguous to separated by one-half of one diameter, and surface between them smooth or scarcely noticeably alutaceous; a few smaller punctures are irregularly distributed amongst coarse ones, and some of the coarse punctures are open behind and have their centres raised. Pubescence of two types and similar to elytral pubescence; long hairs denser on transverse caudal ridge than elsewhere. Pygidium punctate and pubescent like propygidium but with the punctures slightly shallower and the surface between them smooth and strongly shining; apical fourth or fifth highly polished and with coarse punctures absent or nearly so. *Prosternum* coarsely punctate like pronotum; median carinae widely diverging, so that near base of apical lobe they are more than twice as widely separated as on prosternal process. Hypomeron sparsely, microscopically punctate and very lightly, longitudinally alutaceous; dorsally (near pronotal margin) nearly smooth. Metasternum with median longitudinal line fine and complete; lateral discal carina (or stria) well developed and extending caudally and outwards to hind coxa; declivous side with a long, transverse, basal area which is densely, microscopically reticulate and mat. Abdomen with a broad, transverse, reticulate, mat area extending on first sternite from lateral margin nearly to disk. *Legs* with length of femora to tibiae as follows: front leg, 0·82 mm. : 0·76 mm.; middle leg, 1·06 mm. : 1·09 mm.; and hind leg, 1·09 mm. : 1·37 mm. Front tibia (fig. 3) with tarsal groove shallow and nearly entirely exposed from an anterior view. Middle tibia with shape as shown in fig. 4. Hind leg (fig. 12) with a knife-like dorsal femoral carina which extends from near base to slightly beyond apical third; hind tibia with posterior face broadly and deeply concave and near dorsal edge of this concavity with 12 transverse, trichome-containing channels. Setae of legs recumbent to suberect and nearly as long as long setae of dorsal surface; femora and tibiae with many of these long setae longitudinally divided into two or more parts so that these appear to be branched nearly from the base.

Type: ♂, in the British Museum (Natural History). Mexico: Jalisco, Sayula, xi.1923 (*W. M. Mann*).

Paratype: 1, with same data as type.

Comparative notes: This species is closely related to *T. nigritus* Hinton and *T. arizonensis* Ross, but from both of these differs as shown in the key. The new species was found in the nest of a *Pheidole* near *P. kingi* Pergande.

Interspecific Relationships.

The South American species are not available at present, and the descriptions and figures of these are lacking in certain important particulars, so that a discussion of the relationships of the species of *Terapus* must necessarily be confined to the North American forms. I have been able to examine types or topotypes of all of the latter except *T. arizonensis* Ross, which is known to me only from description.

The genus *Terapus* is included in the subfamily Hetaeriinae, a subfamily which contains all the Histerids that have undergone certain morphological specialisations as a result of living in close association with ants and termites. The modifications common to all Hetaeriinae are: (1) the very much thickened and dilated antennal scape which serves to cover the opening of the antennal cavity and thereby conceal and protect the antenna when the latter is retracted; and (2) the very much reduced tibial spurs which may be altogether lost. In addition to these characters the species often have well-developed trichomes associated with exudate glands, most have a reddish-chestnut cuticle, and most are clothed with one or more types of setae, not including the trichomes. Amongst the most specialised species there is, furthermore, a tendency towards lengthening the legs and developing ridges or carinae on the dorsal surface of the body. Thus the Hetaeriinae, which are obviously the most specialised, depart very widely in appearance from the generalised or fairly primitive form of the family, a form which may be briefly characterised as having a black, strongly shining, and hairless body lacking carinae or ridges on the dorsal surface, short legs with well-developed tibial spurs, and a long and moderately narrow antennal scape. It is possible, particularly in view of the enormous differences in their prosternal structure, that the Hetaeriinae as now constituted are polyphyletic in origin and cannot all be derived from ancestors close to the recent Histerinae. However, *Terapus* and other genera are clearly specialised Histerinae.

The North American species of *Terapus* belong to two very clearly marked species-groups as follows: (1) the *mexicanus* group comprising *mexicanus* and *balloui* and (2) the *nigritus* group comprising *nigritus*, *arizonensis*, *manni*, *infernalis*, and *mniszechi*. If the known range of morphological variation within *Terapus* be considered together with what is already known of the progressive morphological specialisations undergone by other Histerids as they become better and better adapted to living in ant nests, it is easy to select the species of the genus which on balance have the least number of specialised characters or, in other words, are the most primitive. It appears certain that the most primitive *Terapus* will have poorly developed trichomes arising from a flat, non-channelled area of the hind tibia, only sparse and simple setae, or none, on the dorsal and ventral surface of the body, short legs with only slightly and evenly dilated tibiae, and no ridges or carinae on the elytra.

As will already be clear from the characters given in the key, the *mexicanus* group possesses a much greater number of primitive characters than the *nigritus*

group. The presence in *balloui* of an inner humeral ridge on the elytra and a large gibbosity on the anterior face of the hind tibia suggest that it is less primitive than *mexicanus*. Between the *mexicanus* and *nigritus* groups there are no intermediates as regards the development of the very striking transversely channelled trichome-containing part of the hind tibia. Intermediates between the two groups as regards this character as well as the numerous correlated characters (see key) are either extinct or as yet undiscovered. Ancestral—or recent but more primitive—forms of the *mexicanus* group would be expected to have shallower and more exposed front tarsal grooves, less broadly dilated tibiae, perhaps no trichomes on the hind tibiae, and a uniformly punctate propygidium.

Of the *nigritus* group, *nigritus*, *arizonensis*, and *manni* are closely related in having only the basal seventh of the hind tibia abruptly constricted and in having the propygidium uniformly punctate, whereas *infernalis* and *mniszechi* have the basal third or fourth of the hind tibia abruptly constricted, the propygidial base microscopically reticulate, and the legs noticeably lengthened. Unless it is assumed that the complicated structure of the hind tibia of the *nigritus* group has been evolved independently on two separate occasions in the genus, it must be assumed that *nigritus*, *arizonensis*, and *manni* have lost the reticulate and mat area of the propygidium present in the *mexicanus* group and are thus, as regards this one character, similar to the ancestors of the *mexicanus* group.

Branched femoral and tibial hairs have been evolved in *nigritus*, *arizonensis*, and *manni*. The proportionally slightly longer legs of *manni* would suggest that it is the most specialised of these three species. *T. infernalis* and *mniszechi* are even more specialised, judging from their elongated legs and the structure of the hind tibiae (see key), than the species just considered. In *infernalis* branched hairs have been evolved on the femora and tibiae, and there can be little doubt that these hairs, which are similar in structure to those of *nigritus* and *manni*, have nevertheless been independently evolved. There is little to choose between *infernalis* and *mniszechi* as regards the degree of specialisation for a myrmecophilous life, the branched hairs of *infernalis* being offset by the greater differentiation between basal and apical halves of the propygidium of *mniszechi* as well as by the greater development of the tarsal grooves of the hind legs of the latter (fig. 15 and key). The phylogeny of the North American species is diagrammatically shown in fig. 16.

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THE DESIGNATION OF CERTAIN GENOTYPES IN THE TRICHOPTERA

By Martin E. Mosely, F.Z.S., F.R.E.S.

To the *Bulletin of the Illinois Natural History Survey* (1944, **23** (1)), Dr. Herbert H. Ross contributes a memorable account of the Trichoptera of Illinois. This complements Betten's Trichoptera of New York State, so that the two works form an indispensable basis for all studies of the North American trichopterous fauna.

In one respect, Ross goes beyond Betten as his account includes, as far as they are known, characters of the larvae of those adult flies which he lists and describes. It seems rather a pity, however, that to a certain extent he has condensed his classification by sinking many genera, and even one important family, the Polycentropidae, erected by Ulmer and others, that have proved of service to the student in identifying his specimens. Moreover, no reasoned explanation is given as to why these genera and families should have been sunk or reduced. In other respects the work is admirable, amply illustrated with large and understandable figures of genitalia.

I must, however, draw the attention of European students of the group to the fixation of some genotypes in this work. For instance, in a paragraph with which Dr. Ross concludes his description of the genus *Hydropsyche* Pictet he writes: " Westwood (1840 : 49) designated *instabilis* Curtis as the genotype of *Hydropsyche*, but since this name was not included in the original description of the genus, it cannot function as the type species. *H. cinerea* Pictet, an originally included species, is here designated the genotype. Pictet's species *cinerea* is considered a synonym of *instabilis*."

Westwood, when he designated the species known as *instabilis* Curtis as the genotype, was not referring to the name but to the insect Curtis had before him. Curtis's species *Philopotamus instabilis* was described in the *Phil. Mag.* published in March 1834. Pictet, after 1 July in the same year (Preface so dated) described the genus *Hydropsyche* without having seen Curtis's work of earlier date, for no mention of it is made in the list of authors consulted. Actually Curtis described several other *Hydropsyche* species in this paper as well as *instabilis*.

With regard to Ross's phrase " since this name was not included in the original description of the genus, it cannot function as the type species," the practice of accepting *names* as types of genera has led to some confusion in the above sentence. Whilst according to some ideas, a name may function as a " genotype," it certainly cannot function as a type species. Pictet described *cinerea* without knowing that it was a synonym of *Philopotamus instabilis*, therefore the species *instabilis* is in fact included in his definition of *Hydropsyche* under the name *cinerea* Pictet. Westwood would consequently appear to have been quite correct and the genotype of *Hydropsyche* must remain *instabilis*.

As regards the citation by Dr. Ross of *marshamella* Stephens as the genotype of *Beraea* Stephens as opposed to Westwood's citation of *pygmaea* Fabricius, there can be no solid reason for upsetting Westwood's citation, which should therefore stand as *pygmaea* Fab.

"Mystacide" in Latreille (1825, *Fam. Nat. Reg. Animal.* : 439) is in the vernacular and is not therefore a valid generic name according to the nomenclature rules. Berthold, in the German edition of the same work, 1827, latinised the name in the form *Mystacides* which is prior to the latinisation *Mystacida* of Latreille, 1829. Since *Phryganea nigra* is the only species mentioned by Berthold in connection with *Mystacides*, the genus is monobasic and *nigra* must stand in place of *longicornis* now designated by Ross.

Ross in this paper designates the genotype of *Apatidea* as *copiosa* McLachlan, but the actual date of the designation is 1935 when, in the *Journal of the Bombay Natural History Society*, I myself designated this species as the genotype.

With regard to *Apatelia*, for which Ross designates *inornata* Wallengren as genotype, in the same number of the Bombay Journal I designated *fimbriata* Pictet, so Ross's present designation cannot stand.

Whether the three genera *Apatania*, *Apatelia* and *Apatidea* should be regarded as synonyms of *Radema* Hagen is a matter on which I am not prepared to express an opinion, as Hagen's genus *Radema* is unknown to me.

Ross sinks Banks's genus *Pristosilo* as a synonym of *Lepidostoma* Rambur, marking his entry as " new synonymy." It should be pointed out that Ulmer, in 1907, placed this genus as a synonym of *Lepidostoma* and the species *canadensis* as a synonym of *togatum* Hagen. Ross's entry should not therefore be indicated as " new synonymy."

I would like, in conclusion, to refer to the unfortunate title which Curtis gave to the paper in which he described the *Hydropsyche* species to which reference has been made above. This title is " Descriptions of some hitherto nondescript British species of Mayflies of Anglers." There are two errors in this title. Curtis was probably the first entomologist to use the name " May Fly " to designate the Order Ephemeroptera. The name May Fly is preoccupied as a popular name, and anglers for countless generations have applied it almost exclusively to three species of *Ephemera*, *E. danica*, *E. vulgata* and *E. lineata*, the last being a very local insect. The name has, however, in some northern districts been applied to the Stone Fly, *Perla cephalotes*, and perhaps *Perla maxima*, the identity of which is in some doubt. As far as I know, in all the five hundred years of angling literature, it has never been applied to any of the caddis flies. Curtis in his title not only confuses the whole Order Ephemeroptera with the individual species of *Ephemera*, a confusion which has unfortunately been continued by most entomological (but not angling) writers, but he confuses them also with the Trichoptera, a confusion which, probably in consequence, has persisted to this very day, for in the *Concise Oxford Dictionary* (3rd ed. 1934) on p. 154 we have the preposterous definition :—

" caddis, — ice. n. Larva of May-Fly, &c."

Finally, I must not fail to acknowledge my indebtedness to Mr. W. H. T. Tams, who gave me the benefit of his great knowledge of entomological literature, thus assisting me considerably in searching out the original references to the species mentioned in this short paper.

THE *CASTNIA* OF PARÁ, WITH NOTES ON OTHERS (LEP. CASTNIIDAE)

By the Rev. A. Miles Moss, F.R.E.S.

(1) *Castnia daedalus* Cramer.

Colour strongly variegated on fore-wing from deep chocolate to lighter tone. The addition of two small white spots near the apex of the fore-wing give the impression of an ocellus, constant here but absent in *Castnia amazonicus*. On underside of fore-wing in both sexes the white stripe reveals long thin dark hair. In *amazonicus* this is replaced by a bed of dark scales, short, thick and very loose—a striking specific distinction.

On a sunny day at the right time of year in Pará both these species may be disturbed among the palms which largely constitute the matto bordering the Rio Guamá, but *daedalus* is the rarer of the two. It seems to favour *Astrocarium murúmurú* with its immensely long black spines, broken pupa shells having been detected in holes of the trunk and in the stocks of fronds low down. I bred my first female in the Perené district of Peru in 1909, having carefully dug it out of the trunk of a Palma real (so-called) at San Luis de Shuaro, a huge brown pupa 90 mm. in length, in its still bigger cocoon. The total expanse of the moth when set, measuring from the wing-tips through the centre of the thorax (as I always do), came to 220 mm., obviously claiming to be the largest and heaviest *Castnia* known.

(2) *Castnia amazonicus* Jordan.

In addition to the features described above, and though very similar, this species is less variegated and more uniform in a lighter key of yellowish-brown and is the smaller of the two, average measurements giving 196 mm. for the female, 160 mm. to 170 mm. for the male. Though apparently local, it is at times quite common in the city gardens and squares, and is constantly being taken by day on mango trunks in the road or on walls or palings, the symmetry of its great triangular form barred and spotted with white catching the eye. It sometimes flies into the house, or is held up for the night by the attraction of an ordinary street-lamp. A captured female will readily lay eggs which strongly resemble elongate ribbed grass seeds, grey in colour and rather smaller than those of *daedalus*. These darken, hatch out, and the tiny maroon grubs are inserted in the crevice of some palm tree to try their luck. I have not actually seen the full-grown larva, but have frequently found the empty pupa-shell projecting from some hole in an Assahy palm, *Euterpe oleracea*, or picked one up beneath a Coco palm, *Cocos nucifera*. Nothing known here of *C. geron* or of *C. preissi*.

(3) *Castnia licus* Drury.

Undoubtedly the commonest Castniid and as abundant throughout Pará as elsewhere, flying on sunny mornings mostly from 10 a.m. till noon over parks and gardens and in and out of houses. *C. licus* is very variable in size, and the frequent partial or total absence of the customary five subapical white spots, particularly in dwarfed specimens, almost suggest two distinct species. I lean more to the view, however, that its reduced size and undeveloped spots, as generally to be detected beneath or when held up to the light, merely result from

the limited feeding of the larva, when restricted by its casual mother to underground feeding on the narrow roots of certain wild Musaceae like Bananeira do matto, *Heliconia brasiliensis* and *psittacorum*, or one of the species of *Ichnosiphon* of the Marantaceae, known as Arumá, for these small specimens are generally noted in the immediate vicinity of such plants. Its chief food-plants, however, where it is really a pest, are the cultivated bananas which often have their main stems reduced to stinking fragments or even their fruiting stalks hollowed to a tube by this ugly white grub. The same remark applies to the cultivated sugar-cane, where the damage is even more insidious and widespread, for here the larva, concealed within the hard stalk, now semi-fermented and filled with debris, gets squashed between wooden rollers, which can hardly be expected to improve the flavour of the cane-juice! The interesting standard variety named *licoidella* occasionally turns up, looking as if its rich brown fore-wings had been dipped in a pool of grey and green so as almost to obliterate its light transverse bars and spots. In expanse the female measures from 120 mm. to 110 mm., the male from 100 mm. to less than 84 mm.

(4) *Castnia syphax* Fabricius.

Out of place in Seitz, and obviously the next related species. A few years ago this used to be common in the Guamá matto and on other woodland paths but seems of late to have entirely disappeared. Though I never actually took its larva, the favoured haunts of the moth, flying like *licus* on sunny mornings, and characteristically settling ever and anon on the tip of a bare twig, pretty obviously pointed to broad clumps of *Ichnosiphon arumá*, in the roots of which it had developed. General wing expanse about 110 mm.

(5) *Castnia evalthe* Fabricius.

Remarkably scarce and local here in Pará today. I failed to catch the first I had seen in a woodland ride behind Miramar, some three miles N.E. of Pará. This was in 1924, and it was only on 8 December 1927 that I caught a fresh female which got broken in the net. Here on the upper woodland path of Utinga leading from Entracamento to Catú a month later I caught a male in the very same place, and have never seen another. The path being lined by the small red-flowering Bananeira do matto, *Heliconia psittacorum* of the Musaceae, and, no other suitable plants growing near, I am once again convinced that the larvae of *evalthe* will some day be found feeding upon its roots. As figured in Seitz, it corresponds better with *euphrosyne* in size: expanse of female 100 mm., male 90 mm.

(6) *Castnia mathani* Oberthür.

A rare moth. At 3 p.m. on 12 September 1929 a grand and very stout female freshly emerged and sitting on a small bush near my back garden, was taken by neighbour Niver Dax, who kindly brought it to me unspoilt. Assuming that she had never flown, the only likely food-plant near was a tall spiny Palm-tree known as Mucujá, *Acrocomia sclerocarpa*, unless she had come from the tuberous roots of an adjacent lily, but I could find no proof of this, there being no indication of a larval hole or empty pupa-case. I have never had the luck to find another, but Dr. Leadbetter, an Englishman and doctor on a Booth ship, brought a perfect male down river from Manáos, having procured it dead for ten milreis together with a set of bright but common butterflies. I told him what it was, the male of *C. mathani* and a great rarity, entirely new to my

eyes; and I advised him on reaching England to pack it up very carefully and send it to Lord Rothschild at Tring. This he did, and on returning to Pará he thanked me for my advice and honesty, for Lord Rothschild was delighted, and had sent him £10 for it! Total expanse of female 154 mm.

(7) *Castnia icarus* Cramer.

From full-grown larvae or pupae in cocoons cut out of the stalks and roots of the common pineapple, *Anana sativa* Brom., I bred a fine series of both sexes. This was a lucky find at Cametá on the Tocantins river, to which on 28 March 1933 I paid a three days' visit; and chancing upon a couple of moths on the wing, I quickly discovered whence they proceeded, an abandoned patch growing a considerable number of old but fruitless pineapple plants. On the arrival of imagines in April some paired, and from ova thus obtained I was able later in the year to rear a small second brood on pines growing in my own Pará garden. The moths, however, were small and impoverished, and I found that I could not establish the species here. I have seen odd specimens flying at Monte Alegre and Santarem but never wild in Pará. I could detect no outward or apparent differences in the larvae or pupae from other Castniids such as the common *licus*. Expanse of female about 110 mm., of male about 100 mm.

(8) *Castnia palatinoides* Jordan.

A species near to *staudingeri*. Not rare in Pará, but by no means easily obtained, as the larva feeds in the heart of arboreal Bromelias, at least three species, one big and smooth-bladed, another spined, formerly growing profusely on the high branches of mango trees on the Souza road; the third a small smooth species growing chiefly on small trees in the shade of the forest and in wet places. Again, as with *licus* and several other Castniids, a great disparity in the size of individual specimens is apparent, the larvae growing big in the big luxuriant plants, and producing full-sized moths like *staudingeri*, as figured in Seitz; those from the "igapó," where I have also noted the moth on the wing, giving specimens not much over half the size. Expanse of big specimens irrespective of sex about 90 mm., of small about 60 mm.

(9) *Castnia superba* Strand.

We now come to a species esteemed as a prize, though it is not altogether rare in Pará as specimens have frequently been taken in houses, seen by me flying in Utinga and by the Rio Guamá, and a number have occurred in my own city garden, both sexes having been bred from the egg here on big spined and smooth arboreal Bromelias. I brought most of these plants years ago from the "igapó" of Maués, and fixed them up on the trunks of Abacáto and other fruit trees as food-plants for larvae. Today they are a great flowering mass of blades and have thrived exceedingly, making a handsome show. Between the broken dead blades in roots at the base I have successfully dug out the cocoon with its long brown spined pupa and bred the moth. Several others have been taken here on emergence, and in the same place I have found the eggs, looking like seeds of wheat, or thin white papery shells holed near one end by the grub on hatching. These eggs are of a delicate light emerald green when laid, rather bigger than those of *daedalus*, and of the same grass-seed shape, ribbed lengthwise. From ova laid in captivity I have been able to augment the stock, leaving the eggs to nature, as it is manifestly impossible to follow up the career of internal feeders, often of slow growth. At 12.30 p.m. on 10.x.44 I bottled a magnificent recently emerged female in my back garden, which, after flying through the house, drew me to the exact spot for oviposition,

and settled at the shaded base of a big spined Bromelia at about six feet from the ground on a *Graviola* trunk. She was in perfect condition and of maximum size, measuring 140 mm. Males formerly caught or bred vary from 120 to 106 mm. Time of flight in the sun—10 a.m. to early afternoon. Thirteen records of emergences—5 Sept. to 15 Nov.

(10) *Castnia emiliae* Fassl, (11) *C. cronis* Cramer and (12) *C. cronida* Herrich-Schaeffer.

Referred to as Pierid-like Castnias, I take these three species together. All three occur in and around Pará, but none of them can be described as common. Once again they are Bromelia feeders, and all three proceed from larvae and pupae to be obtained on rare occasions among the decaying stalks and roots of various arboreal forms, generally growing out of reach on the branches of mango and other trees on the roads to Souza, Utinga, Murútucú, Pinheiro and elsewhere. Though I have had the good fortune to breed a sample of each species, so limited have been the chances for making accurate observations of early stages that the chance discovery of any particular larva or pupa in an arboreal Bromelia can provide little more than a guess as to which of some half-dozen species one is likely to rear from it. Of *emiliae*, the smallest and perhaps the commonest of the three in Pará, a succession of three or four in as many days on one occasion proved beyond doubt that without my observation they had been reared on my own home-grown garden Bromelias. Average expanse of *emiliae* about 70 mm.; of *cronis* about 95 mm.; of *cronida* about 105 mm.

(13) *Castnia rutila* Felder.

Strand could only record this rare species as coming from Brasil! "Somewhere in Brasil" is somewhat vague, and he makes no attempt at description. I regret that I am unable to reveal its early stages, but I can at least improve its record in the following description :—At 2.15 p.m. on 9 Feb. 1939 after some rain, while walking down the main avenue leading to the Utinga waterworks with Manoel Correa, a big red moth flew up but only for a short distance, settling again on the grass at the side of the road. The boy put my net over it, and I bottled an absolutely perfect specimen of something new and unknown. When I had had time to examine it, I found it was of a very intense terra-cotta red all over, suffused with a greenish iridescence about the thorax. In addition to a central black spot on the costa touching a thin black oval ring, the fore-wing exhibited a curved row of six black spots nearly parallel to the outer margin. The hind-wing was beautifully edged with black, and paralleled with a row of seven black spots. Lacking in pattern, it was nevertheless a magnificent creature, a newly emerged female and without a scratch. As it is very inadequately figured in Seitz, as soon as it was set I painted a measured illustration of it in water colours with every possible care and accuracy, finding its total expanse to be 130 mm. From the Seitz figure the male may be said to measure 106 mm. As to its origin, I can only surmise that it had just flown down, perhaps disturbed by the rain, from one of the arboreal Bromelias noted on a tall tree above the spot, or perchance an orchid, an order of plant-life ever getting rarer through the devastating greed of "Homo sapiens"! This was indeed a prize, rightly reckoned a great rarity, and I have never seen another.

(14) *Castnia therapon* Kollar.

Not seen in Pará, but a nice series of small specimens in both sexes was reared by me from larvae found at Pernambuco. They were taken in September

1936 in the roofed Orchid house of my friend Mr. Gordon Patterson, and, to the annoyance of his gardener, were discovered feeding upon the roots and tubers of his *Cattleya* orchids. The larvae afterwards ate *Oncidium* in captivity, which perhaps resulted in their reduced size. The moths emerged in Pará from Oct. 26 to Nov. 26, and measured from 80 to 86 mm.

(15) *Castnia pylades* Stoll.

An immense and attractive species well distributed in the country around Pará, but never to be regarded as common. Its scales above, below and on the fringe are exceptionally large and loose, so that, coming off with the least touch, this strange, shaggy but very handsome moth is all too easily spoiled. As its egg is not on the model of the elongate ribbed grass-seed, like all the rest I have examined, but a dull-coloured loose ball, a perfect sphere full twice the size of the egg of the largest Hawk moth, I take it that *pylades* bears no very close relationship to any of the foregoing species. If correct in my surmise, this is a biological consideration of the first importance in any future Revision of the Castniids.

I have taken this moth on a palm-trunk in woodland shade near Mosqueiro, and on another occasion on the outskirts of Pará I have seen a female fluttering down to the base of a bushy Tucumá palm as intent upon oviposition. Some years ago Mr. Lima caught me three battered specimens among palms in swampy ground near Murútucú. From combined general observations therefore I discredit Strand's statement that it "lives in Bananas," and regard the palms *Astrocaryum*, *Tucumá* and *Murúmurú* and perhaps Assahy (*Euterpe oleracea*) as the more likely pabula for the larvae of *pylades*. I wish I could procure new material and experiment with the eggs. Having no specimens by me to measure, I give expanse of female 170 mm., and the often smaller male 145 mm.

(16) *Castnia pelasgus* Stoll.

A small and insignificant species not found in Pará, and at first sight taken for an Arctiid. To the N.E. of the little township of Maués runs a road for a mile or more through moderate woodland where on suspended bananas I was successful in catching two kinds of *Agrias*. It was here that I also netted a few of this small *Castnia*. Unfortunately I noted nothing of its sex-differences, larva, food-plant or habits. It appears to have no close relatives. Expanse about 66 mm.

(17) *Castnia heliconioides* Herrich-Schaeffer.

A species of the *gazera* group not in Pará, but commonly observed up-river at Manáos, Teffe, Iquitos, etc. At Teffe in August 1935 a caught female gave me some eggs of the "grass-seed" form which hatched at Manáos before I got back. I kept the young larvae fresh for some days in the cell-like cavities of a thick banana stalk which I was pleased to find they began to consume. However, not being the approved pabulum, as I suppose, they began to die off, and only one continued to eat and grew so well that it eventually spun its cocoon and pupated. This exceeded my early anticipations. By May next year it began to prepare for emergence. Just as my hopes ran high disaster supervened, and my disgust was unmeasured when, on entering my bathroom one morning, I found that both a centipede and a cockroach had discovered my poor pupa and had sucked it dry in the night! I am not aware that *heliconioides* has ever been bred in captivity or its normal food-plant recorded, so my small experiment has at least the rather subdued value of establishing the banana stalk as a possible alternative. Total expanse about 100 mm.

DROSOPHILA SUBOBSCURA COLLIN: DESCRIPTIVE NOTES ON THE SPECIES WITH COMMENTS ON ITS NOMENCLATORAL STATUS (DIPTERA)

By John Smart, B.Sc., Ph.D., F.R.E.S.

(*Department of Entomology, British Museum (Natural History), London.*)

In 1933 Professor A. H. Sturtevant trapped a species of *Drosophila* in England. Specimens submitted to Mr. J. E. Collin of Newmarket were identified by him as *D. subobscura*: this was a MS. name. The species was then bred in the laboratories of the Department of Biometry, University College, London, and used there for experimental work in genetics. One paper appeared reporting the results of experimental work and the species was called *D. subobscura* therein. At this time all parties immediately concerned knew that *D. subobscura* was a MS. name but it was anticipated that, at an early date, Mr. Collin would take the necessary steps to publish a description of the species and so validate the name. No such description appeared but, fortunately, three years later, Gordon (1936) inserted a note in a paper of his in which, attributing the name *D. subobscura* to Collin, a diagnosis of the species was given in which both sexes were compared and differentiated from the nearest related species, *D. obscura* Fallén. The note in Gordon's paper takes the form of an original contribution by Collin. The name *D. subobscura* Collin thus dates from 1936, since in none of the previous papers in which the name is used is a description of the species given that will satisfy the rules of nomenclature. Prior to the appearance of Gordon's (1936) paper it must therefore be regarded as a MS. name. In the papers reporting the results of the genetical experimental work the tendency is, as is usual in such papers, to omit the author's name when speaking of the species and to call it "*Drosophila subobscura*" not "*Drosophila subobscura* Collin" which is of course, nomenclatorally, the more correct form.

Mr. Collin has informed the author (*in litt.* 7.v.44) that he first realised that *D. subobscura* was a distinct species when dealing with specimens taken by himself in 1896. Subsequently he found that it was both common and widespread and he applied the name *D. subobscura* to it in his collection. In 1918 Mr. Collin bred the species from diseased Iris roots and he has also taken it on exuding sap in the company of *D. obscura* Fallén and *D. tristis* Fallén. Mr. Collin's reluctance in the matter of publication of the name was due to the fact that he knew that the type of *D. obscura* Fallén existed but he had not had an opportunity to compare specimens of the species called *D. obscura* in this country with that type and so make certain that the name was correctly applied, doubt on this point having arisen when it was discovered that the species called *D. obscura* Fallén was in fact less common than the newly differentiated but closely related *D. subobscura*.

The British Museum (Natural History) has, prior to 1936, identified material submitted to it as *D. subobscura* Collin. This was probably done on the basis of specimens and information exchanged between Mr. Collin and the late Dr. F. W. Edwards. No doubt Mr. Collin also attached the name to material sent to him by correspondents before 1936. Fortunately, since the identifications were correct and the name validated in 1936, it is immaterial that in those made prior to the appearance of Gordon's (1936) paper the name was a MS. one.

Two years after the appearance of Gordon's (1936) paper Séguy (1938) described a new species of drosophilid from Kenya to which he gave the name *D. subobscura*. This *D. subobscura* was recorded in the *Zoological Record* for 1938 (published July 1939). Unfortunately the name *D. subobscura* Collin in Gordon (1936) has not yet appeared in the *Zoological Record*[1] as a new species.

Early in 1944 Professor J. B. S. Haldane, discovering Séguy's use of *subobscura* for the Kenya species, communicated with Mr. Collin with the object of finding out if the latter had published a full description of the species collected by Professor Sturtevant in 1933. Mr. Collin replied (*in litt.* 9.iii.1944) that he had not; that he expected that in one or other of the papers reporting experimental work on the species there would be a sufficient description to validate the use of the name prior to Séguy's use of it; and that Professor Haldane was at liberty to take any steps he wished to put the matter in a correct state.

Professor Haldane (*in litt.* 27.iii.1944) then communicated with the Department of Entomology, British Museum (Natural History) for advice on the subject and the matter was referred to the author.

The author (*in litt.* 19.iv.1944) stated that, in his opinion, the description in Gordon's (1936) paper validated the use of the name *D. subobscura* Collin for the species to which the name had been applied and that Séguy's (1938) name was a homonym and that the latter's *D. subobscura* from Kenya would have to be given a new name.

Below are some further notes on the species which will serve to amplify Gordon's brief note of 1936.

Drosophila subobscura Collin.

Drosophila subobscura Collin in Gordon, 1936, *J. Genet.* **33** : 60.
Drosophila subobscura of Gordon, 1935, *Amer. Nat.* **69** : 381–382.
Drosophila subobscura of Gordon, 1936, *J. Genet.* **33** : 25–60.
Drosophila subobscura of Emmens, 1936, *J. Heredity* **27** : 351.
Drosophila subobscura of Emmens, 1937, *Z. f. Zellforschung u. mikroskopische Anatomie* **26** : 1–20.
Drosophila subobscura of Sturtevant, 1939, *Proc. Nat. Acad. Sci.* **25** : 137–141.
Drosophila subobscura of Gordon, Spurway & Street, 1939, *J. Genet.* **38** : 37–90. (Photographs of adult female; figure of wing.)
Drosophila subobscura of Christie, 1939, *J. Genet.* **39** : 47–60.
Drosophila subobscura of Sturtevant, 1940, *Genetics* **25** : 336–353.
Drosophila subobscura of Kalmus, 1941, *Proc. Roy. Soc.* (B) **130** : 185–201.
Drosophila subobscura of Kalmus, 1942, *Nature* **150** : 405.
Drosophila subobscura of Kalmus, 1942, *Proc. R. ent. Soc. Lond.* (A) **17** : 127–133.
Drosophila (*Sophophora*) *subobscura* Collin of Sturtevant, 1942, *Univ. Texas Publ.*, no. **4213** : 29.
Drosophila subobscura of Kalmus, 1942, *J. exp. Biol.* **19** : 238–254.
Drosophila subobscura of Kalmus, 1942, *J. Genet.* **44** : 194–203.
Drosophila subobscura of Philip, 1942, *Nature* **149** : 527–528.
Drosophila subobscura of Kalmus, 1943, *J. Genet.* **45** : 206–213.
Drosophila subobscura of Philip, 1944, *Nature* **153** : 223.
Drosophila subobscura of Philip, Rendel, Spurway & Haldane, 1944, *Nature* **154** : 260–262.
Drosophila subobscura of authors publishing abstracts of the above papers in *Zool. Rec.* and other places.
Drosophila subobscura of authors in *Drosophila Information Service, Repts.*, at various dates and places.
Drosophila subobscura of authors following Gordon (1936).
Drosophila subobscura Collin, MS. name attached to specimens determined by Collin.
Drosophila subobscura Collin, MS. name attached to specimens determined by Edwards, and others, submitted to the British Museum (Natural History).
Not *Drosophila subobscura* Séguy, 1938, *Mem. Mus. Hist. nat. Paris* (n.s.) **8** : 352 (for which a new name is proposed below).
Not *Drosophila subobscura* Séguy, 1939, *Zool. Rec.* **75** (Pt. 12) : 384.

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[1] The author has drawn the attention of the editor of the *Zoological Record* to the name and, presumably, it will be recorded in the volume for 1944.

A fly of the genus *Drosophila*, brown in colour with a grey pollinosity of varying intensity, wings clear, halteres yellow, legs yellowish, eyes red, turning partially brown in places in the dried dead specimen. 2 mm. in length. Sturtevant (1942) places the species in the subgenus *Sophophora* and in the " *obscura*-group " of that subgenus.

Male. Arista 6–8 branched with 1 or 2 branches below the terminal fork (here reckoned as two branches). Antenna brown, grey pollinose, more or less concolorous with the rest of the head-capsule. Front dark brown, matt, without any pollinosity except on the frontal triangle and the fronto-orbital plates which are shiny and slightly pollinose. Carina rounded, widening below, it and the face generally of a paler brown, grey pollinose. Genae brown, heavily grey pollinose. Ocelli of the same colour as the eyes.

Upper reclinate fronto-orbital bristles long, middle reclinates short, lower proclinate fronto-orbitals medium in length; the relative proportions of the three being 4 : 2 : 3. Ocellar bristles, post-verticals, inner and outer verticals all about as long as the upper reclinate fronto-orbitals. The bristle immediately behind the vibrissa less than half the length of the latter.

The dorsum of the thorax is brown, grey pollinose; there are no traces of any longitudinal stripes or lines upon it. Two pairs of well-developed dorso-central bristles; 8–10 rows of acrostichal hairs (counted just forward of the anterior pair of dorsocentrals); no acrostichal (or prescutellar) bristles developed. Anterior scutellar bristles lie parallel to each other, perhaps with a tendency to converge. Anterior sternopleural bristle shorter than the posterior one; sterno-index 0·6.

Wings colourless; venation has been figured by Gordon, Spurway and Street (1939); costal bristles usually extending to a point just midway between the terminations of the 2nd and 3rd longitudinal veins (radius 2 + 3 and radius 3 + 4), but sometimes extending only just beyond the termination of the 2nd longitudinal vein.

Legs yellowish; pre-apical tibial bristles and apical tibial bristles not exceptionally long. Combs of teeth each set on the longitudinal axis of the 1st and 2nd tarsal segments of the fore legs; the comb of the 1st segment (proximal comb) with 7–12 teeth and about as long as half the length of the segment or slightly more and situated towards the distal end of the segment; that of the 2nd segment (distal comb) with 10–13 teeth and longer than half the length of the segment but also situated towards the distal end of the segment. 1st tarsal segment slightly longer than either 2nd or 3rd but much shorter than the combined length of the 2nd and 3rd.

Abdomen with the tergites uniformly dark brown, shiny in some lights, but showing a grey pollinosity in others.

Female. Resembles the male in the characters noted above except, of course, in respect of the tarsal combs.

Egg. Of the *melanogaster* type; smaller than that of *D. obscura* Fallén with the two filaments shorter, about half the length of the egg itself.

Larva. Of the usual drosophilid type.

Pupa. Of the usual drosophilid type; anterior spiracles with 5–7 branches, four of which are rather larger than the others but all are shorter than the stout stem of the spiracle.

Distribution. Widespread in the British Isles, occurring at least as far north as Inverness and taken on the wing from April to January inclusive. Buzzati Traverso and Pomini, of the University of Pavia, on the basis of facility of crossing and normality of offspring, consider it conspecific with a species they have trapped in Germany and Italy (Noted in *Drosophila Information Service* No. 13, June 1940, but more data from a letter to a member of the Department of Biometry, University College, London). Further distribution unknown but not yet recorded from the North American continent.

Variation. Gordon, Spurway and Street (1939) have presented an analysis

of three wild populations of the species from the geneticist's point of view. The other references given above will serve as an introduction to the genetical literature of the species.

Types. Mr. Collin (*in litt.* 7.v.44) indicates that he considers the series of specimens bred by him from diseased Iris roots as the type series (*i.e.* as co-types); he intends to send specimens from this series to the British Museum (Natural History).

Professor Haldane has presented to the British Museum a series of specimens of the species as it is bred in his laboratory.

The original description of *Drosophila subobscura* Collin may not be readily accessible to some readers and it is therefore quoted here :—

"Note. *Drosophila subobscura* sp. n. ♂♀. By J. E. Collin, F.R.E.S. A common and widely distributed species hitherto included under *D. obscura* Fln., which it generally resembles, though easily distinguished in the male sex by its larger tarsal 'combs' on first and second joints of front tarsi (that on first joint occupying about apical half, on second joint more than apical half), while in both sexes the thorax is uniformly light brownish-grey without even faint indications of darker stripes. Length about 2 mm."

Drosophila séguyi nom. n.

Drosophila subobscura Séguy, 1938, *Mem. Mus. Hist. nat. Paris* (n.s.) **8** : 352. preoc. *Drosophila subobscura* Collin in Gordon (1936).
Drosophila subobscura Séguy of *Zool. Rec.* **75** (Pt. 12) : 384.

Séguy's species comes from Kenya. It is to be presumed that Séguy applied the name *subobscura* to his species in ignorance of the earlier use of the name. The species are obviously distinct, since in Séguy's species the tarsal combs are said to occupy the whole length of the tarsal segments concerned. The fact that *subobscura* Collin (1936) escaped notice in the *Zoological Record* at the time of publication would explain Séguy's use of the preoccupied name.

Summary.

The nomenclatoral status of *Drosophila subobscura* Collin (1936) is discussed and some of the characteristics of the species noted. *Drosophila séguyi* nom. n. is proposed for *Drosophila subobscura* Séguy (1938).

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Mr. J. E. Collin has very kindly read through the manuscript of the present paper, made critical comments thereon and furnished additional information for incorporation in it that would otherwise have eluded me; for this assistance I have to thank Mr. Collin. Professor J. B. S. Haldane has also supplied particulars which have been incorporated in the paper and for which I have to thank him.

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Spurway, H., 1945, "The genetics and cytology of *Drosophila subobscura*. I. Element A. Sex-linked mutants and their standard order." *J. Genetics* **46** : 268.

Rendel, J. M., 1945, "The genetics and cytology of *Drosophila subobscura*. II. Normal mating and selective mating in *Drosophila subobscura*." *J. Genetics* **46** : 287.

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